

Claims

- [c1] A system for forming a tool string, the system comprising:
two downhole tools adapted to be coupled in series via a connection, wherein the connection restrains axial translation of one tool with respect to the other; and
a compressible sleeve arranged between the two tools, the sleeve adapted to facilitate axial rotation between the tools when substantially compressed, the sleeve adapted to impede axial rotation between the tools when substantially decompressed.
- [c2] The system of claim 1, wherein the connection comprises a plurality of horizontal threads formed on one tool and a plurality of receiving threads formed on the other tool, the receiving threads adapted to receive the horizontal threads.
- [c3] The system of claim 1, wherein the connection comprises a plurality of ribs formed on one tool and a plurality of grooves formed on the other tool, the grooves adapted to receive the ribs.
- [c4] The system of claim 1, wherein the tool string is formed

at a surface location before being run into a wellbore.

[c5] The system of claim 1, wherein the two downhole tools are guns and the tool string is a perforating string.

[c6] A connection system, comprising:
a first downhole tool having a threaded end;
a second downhole tool having a threaded end adapted to receive the threaded end of the first downhole tool, the second downhole tool having a tapered recess formed on the threaded end; and
a sleeve having a tapered element formed on one end, the tapered element shaped to mate with the tapered recess of the second downhole tool, the sleeve connectable to the first downhole tool such that the tapered element is biased toward the second downhole tool.

[c7] The connection system of claim 6, wherein the sleeve is axially deflectable in response to a compressive force.

[c8] The connection system of claim 6, wherein the threaded end of the second downhole tool is a threaded axial bore having an open end for receiving the threaded end of the first downhole tool and a closed end having a plurality of radial grooves formed therein.

[c9] The connection system of claim 8, wherein the first downhole tool comprises a plurality of keys formed on

the threaded end, the keys adapted to engage the grooves of the second downhole tool.

- [c10] The connection system of claim 9, wherein each radial groove forms a substantially 60 degree arc.
- [c11] The connection system of claim 6, wherein the threaded end of the first downhole tool comprises a plurality of horizontal threads, the horizontal threads arranged in axial columns having a predetermined width.
- [c12] The connection system of claim 11, wherein the threaded end of the second downhole tool comprises a plurality of horizontal receiving threads adapted to receive the threads of the first downhole tool, the horizontal receiving threads of the second downhole tool arranged in axial columns having a predetermined width substantially equal to the width of the axial columns of the first downhole tool.
- [c13] The connection system of claim 12, wherein the horizontal threads nearest the end of the first downhole tool have a width greater than the width of the other threads, and wherein the horizontal receiving threads farthest from the end of the second downhole have substantially the same width as the horizontal threads nearest the end of the first downhole tool.

- [c14] The connection system of claim 12, wherein the first downhole tool comprises a horizontal ring formed around the circumference at a location farther from the end of the first downhole tool than the horizontal threads, the ring protruding radially outward to engage the horizontal receiving threads of the second downhole tool.
- [c15] The connection system of claim 6, wherein the first downhole tool and the second downhole tools are perforating guns.
- [c16] A tool string connector comprising:
a tubular body having two open ends, the tubular body having a plurality of slots formed therein, the tubular body adapted to axially deflect in response to a compressive force, the tubular body being connectable to a first downhole tool; and
a tapered element formed on one end of the tubular body, the tapered element formed to engage with a mating tapered element on a second downhole.
- [c17] The tool string connector of claim 16, wherein the tubular body is adapted to deflect to allow the first downhole tool to engage the second downhole tool.
- [c18] The tool string connector of claim 17, wherein the tubu-

lar body is adapted to substantially decompress to engage the tapered element with the mating tapered element of the second downhole tool.

[c19] The connection system of claim 17, wherein the first downhole tool and the second downhole tools are perforating guns.

[c20] A connection system for use in well operations, the connection system comprising:
a first downhole tool having a top end and a bottom end, the first downhole tool comprising a plurality of threads formed on the bottom end;
a second downhole tool having a top end and a bottom end, the second downhole tool comprising: (i) a threaded axial bore formed in the top end for receiving the threads of the first downhole tool, and (ii) at least one tapered element formed on the top end; and
a sleeve connected to the first downhole tool and having a top end and a bottom end, the sleeve comprising at least one tapered element formed on the bottom end to mate with the tapered element of the second downhole tool, the sleeve moveable between: (i) a compressed state, wherein the first downhole tool may rotate into threaded engagement with the second downhole tool, and (ii) a substantially decompressed state wherein the tapered element of the sleeve mates with the tapered el-

ement of the second downhole tool to prevent the downhole tools from rotating out of threaded engagement.

- [c21] The connection system of claim 20, wherein the first downhole tool and the second downhole tools are perforating guns.
- [c22] A method, comprising:
 - connecting two downhole tools in series by compressing a sleeve and rotating one tool into threaded engagement with the other tool; and
 - locking the tools together by decompressing the sleeve, wherein the sleeve engages each tool to prevent the tools from rotating out of threaded engagement.
- [c23] The method of claim 22, further comprising:
 - unlocking the tools by compressing the sleeve, wherein the sleeve disengages from one of the downhole tools; and
 - disconnecting the tools by rotating one tool out of threaded engagement with the other tool.
- [c24] The method of claim 22, wherein the downhole tools are perforating guns.
- [c25] A method for forming a tool string for use in well operations, the method comprising:
 - compressing a sleeve arranged between two tools;

rotating one tool into threaded engagement with the other tool; and
decompressing the sleeve to lock the tools together in a predetermined alignment.

[c26] The method of claim 25, wherein the tool string is a perforating string and the two tools are perforating guns.

[c27] A method, comprising:
connecting two downhole tools in series; and
locking the two downhole tools into alignment with respect to one another,
wherein no person comes into physical contact with the downhole tools to connect or lock the tools.

[c28] The method of claim 27, wherein the downhole tools are perforating guns.

[c29] A system for making a hands-free connection, comprising:
two downhole tools adapted to be coupled in series;
a mechanism for restraining axial translation of one tool with respect to the other; and
a mechanism for restraining axial rotation between the tools.

[c30] A method, comprising:
connecting two perforating guns in series without human

contact with the guns.

- [c31] Apparatus for aligning two downhole tools, comprising:
a compressible body adapted to connect with one downhole tool; and
a tapered element formed on one end of the body, the tapered element adapted to engage the other downhole tool.
- [c32] The method of claim 31, wherein the two downhole tools are perforating guns.